WHAT IS CLAIMED IS:

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1. An optical system, comprising:

a diffractive optical element having a diffractive optical surface; and

means for preventing a change in optical performance of said optical system due to deformation of said diffractive optical element when said diffractive optical element is provided in said optical system.

2. An optical system according to Claim 1, wherein deformation of said diffractive optical element when said diffractive optical element is provided in said optical system includes deformation by weight of said diffractive optical element.

3. An optical system according to Claim 1, wherein deformation of said diffractive optical element when said diffractive optical element is provided in said optical system includes deformation produced by fixing said diffractive optical element in said optical system.

4. An optical system according to Claim 1, wherein said preventing means includes an optical member having an optical characteristic that compensates for a change in optical performance due to

deformation of said diffractive optical element.

5. An optical system according to Claim 4, wherein said optical member has at least one aspherical surface.

6. An optical system according to Claim 1, wherein said preventing member includes a reinforcing member connected to said diffractive optical element and arranged so as not to degrade the function of said diffractive optical surface, and wherein said reinforcing member effectively prevents deformation of said diffractive optical element.

7. An optical system according to Claim 6, wherein said reinforcing member comprises a ring-like element adhered to a peripheral edge portion of said diffractive optical element, and wherein effective light is not projected on the reinforcing member.

8. An optical system according to Claim 7, wherein said ring-like element comprises a non-transparent material.

9. An optical unit, comprising:

a diffractive optical element having a diffractive optical surface; and

a reinforcing member connected to said diffractive optical element substantially without damaging the function of said diffractive optical surface.

10. An optical unit according to Claim 9, wherein said reinforcing member comprises a ring-like element adhered to a peripheral edge portion of said diffractive optical element, and wherein effective light is not projected on the reinforcing member.

11. An optical system according to Claim 10, wherein said ring-like element comprises a non-transparent material.

12. An optical instrument, comprising:

an optical system, said optical system including (i) a diffractive optical element having a diffractive optical surface, and (ii) means for preventing a change in optical performance of said optical system due to deformation of said diffractive optical element when said diffractive optical element is provided in said optical system; and

means for holding said optical system in said optical instrument.

13. An optical instrument, comprising:

an optical unit, said optical unit including (i) a diffractive optical element having a diffractive optical surface, and (ii) a reinforcing member connected to said diffractive optical element substantially without damaging the function of said diffractive optical surface, said reinforcing member effectively preventing a change in optical performance of said optical unit due to deformation of said diffractive optical element; and

means for holding said optical unit in said optical instrument.

14. A projection exposure apparatus, comprising:

an illumination optical system for illuminating a pattern formed on a mask; and

a projection optical system for projecting the pattern of the mask onto a wafer, said projection optical system including (i) a diffractive optical element having a diffractive optical surface, and (ii) means for preventing a change in optical performance of said projection optical system due to deformation of said diffractive optical element when said diffractive optical element is provided in said projection optical system.

15. A projection exposure apparatus, comprising:

an illumination optical system for

illuminating a pattern formed on a mask; and

a projection optical system for projecting the pattern of the mask onto a wafer, said projection optical system including (i) a diffractive optical element having a diffractive optical surface, and (ii) a reinforcing member connected to said diffractive optical element substantially without damaging the function of said diffractive optical surface, said reinforcing member effectively preventing a change in optical performance of said optical system due to deformation of said diffractive optical element.

16. A device manufacturing method including a process for transferring, through projection exposure, a pattern of a mask onto a wafer by use of a projection exposure apparatus as recited in Claim 14.

17. A device manufacturing method, comprising the steps of:

transferring, through projection exposure, a pattern of a mask onto a wafer by use of a projection exposure apparatus as recited in Claim 15; and

developing the exposed wafer.